

REMARKS/ARGUMENTS

The Examiner's Office Action and the cited references have been given careful consideration. Following such consideration, claims 1, 3, 10 and 12 have been amended. Claims 2, 4-9, 11 and 13 are unchanged by the present amendment. It is respectfully requested that the Examiner reconsider the claims in their present form, together with the following comments, and allow the application.

The Examiner has objected to the last paragraph of page 3 of the Specification and claim 1. In response thereto, the Specification on page 13, line 32 has been amended to replace item "15" with item "19." The parentheses around "outer nozzle pipe" have been removed and the phrase "a nozzle pipe" has been deleted from claim 1. It is respectfully requested that the Examiner withdraw the objections to the Specification and claim 1.

The Examiner has rejected claim 12 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicant regards as the invention. Appropriate corrections have been made by amendment. Accordingly, it is respectfully requested that the Examiner now withdraw the 35 U.S.C. 112, second paragraph rejection.

The present invention relates to a nozzle element for use in an industrial furnace. The nozzle is designed to reduce the wear of the refractory material around the nozzle. It is believed that the wear of the refractory material around the nozzle can be reduced by allowing "scale," i.e., an incrustation of solidified metal melt, to form on the refractory material. The formation of scale can be promoted by cooling the refractory material in the area around the nozzle.

As shown in FIGS. 1 and 2, a nozzle body 3 is formed of a refractory material. Nozzle body 3 includes a hot side 5 and a cold side 7. A metal jacket 9 is disposed on cold side 7 of nozzle body 3. Covering plates 10 are disposed over metal jacket 9 such that a flow cavity is defined between metal jacket 9 and plate 10. An inlet opening 12 and an outlet opening 14 are formed in plate 10 to fluidly communicate with the cavity defined between metal jacket 9 and covering plate 10.

An outer nozzle pipe 19 extends from cold side 7 to hot side 5 of nozzle body 3. A plurality of heat-conducting elements 11, 13, 15, 17, 17.1, 17.2 are embedded in nozzle body 3. Heat-conducting element 13 extends from metal jacket 9 to hot side 5 of nozzle body 3. Heat-

conducting element 11, 15, 17, 17.1, 17.2 is embedded in nozzle body 3 such that heat-conducting element 11, 15, 17, 17.1, 17.2 is disposed a distance from hot side 5 of nozzle body 3. In one embodiment, heat-conducting element 11 has one end attached to metal jacket 9. In another embodiment, heat-conducting element 17.1, 17.2 has one end attached to heat-conducting element 17. In yet another embodiment, heat-conducting element 15 is surrounded on all sides by the refractory material.

During operation of the present invention, hot side 5 is exposed to a metal melt during a melting process and a cooling fluid is circulated through the cavity defined between metal jacket 9 and plate 10. Heat-conducting elements 11, 13, 15, 17, 17.1, 17.2 are designed to absorb heat from hot side 5 and convey the heat rapidly from hot side 5 to cold side 7, i.e., to metal jacket 9. As a result, the temperature of nozzle body 3 around outer nozzle pipe 19 decreases, thereby facilitating the formation of scale on nozzle body 3 around outer nozzle pipe 19.

The Examiner has rejected claims 1-10 and 13 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,371,759 to Wells et al.

The '759 patent discloses a hearth electrode 9 for better cooling and improving the starting conditions of a direct current arc furnace. As best seen in FIG. 2, hearth electrode 9 is disposed in an electrode block 10. Hearth electrode 9 is comprised of a plurality of metal bars 11. Each metal bar 11 is disposed in a tube 18 such that an annular duct 17 is defined therebetween. Tubes 18 are attached to electrode block 10. A plate 14 is attached to electrode block 10 to define a space 19 therebetween, such that space 19 fluidly communicates with annular duct 17. During operation of the apparatus disclosed in the '759 patent, a cooling fluid is introduced into space 19. The fluid then flows into annular duct 17 and into the arc furnace. In this respect, the cooling fluid protects metal bars 11 from damage due to steel and slag in the furnace (see column 2, line 68 to column 3, line 4 of the '759 patent). In other words, tubes 18 define flow paths for a cooling fluid. In addition, in order for bar 11 or tube 18 to absorb heat and convey it to the metal jacket, bar 11 and tube 18 would have to come in contact with the molten bath in the furnace. However, this is not possible as any molten metal which would come in contact with bar 11 or tube 18 would flow in the annular duct 17 defined between bar 11 and tube 18, and hence would clog duct 17. It is respectfully submitted that the '759 patent does not

teach, suggest or show a heat-conducting element for absorbing heat and rapidly conveying the heat to a metal jacket, as defined in claim 1.

Claims 2-10 and 13 depend from claim 1 and should be allowed for at least the same reasons stated above for claim 1.

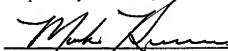
The Examiner has rejected claims 11 and 12 under 35 U.S.C. 103(a) as being unpatentable over the '759 patent in view of U.S. Patent No. 5,465,942 to Wells et al. The '942 patent discloses an arrangement for the introduction of agents into a molten bath. It is respectfully submitted that the '942 patent fails to teach, suggest or show the deficiencies noted above regarding the '759 patent. Claims 11 and 12 depend from claim 1. Therefore, claims 11 and 12 are allowable for at least the same reasons stated above for claim 1.

In view of the foregoing comments, it is respectfully submitted that the present application is now in proper condition for allowance. If the Examiner believes there are any further matters that need to be discussed in order to expedite the prosecution of the present application, the Examiner is invited to contact the undersigned.

If there are any fees necessitated by the foregoing communication, please charge such fees to our Deposit Account No. 50-0537, referencing our Docket No. BE9264PCT(US).

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Respectfully submitted,



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